

# Use of QTL Detected for Resistance to *Phytophthora* in *Theobroma Cacao* L.

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## Abstract\*

In the framework of a CAOBISCO sponsored project the genetic bases of resistance to several species of *Phytophthora* have been studied. Different significant QTL identified make it possible to accumulate various genes to improve varietal resistance. Markers closely linked to QTL could allow to control at early stages the presence of resistance alleles in progenies. Several applications or strategies using QTL analyses could be considered to improve the resistance level.

- *Creation of genotypes homozygous for resistance alleles.* The most resistant clones, as SCA6 and SNK413, could have the resistance genes in a homozygous condition. The identification of a QTL means a heterozygous condition of the resistance gene identified in the parent studied. By selfing the genotypes and using Marker Assisted Selection (MAS) it is possible to produce and screen selfed progenies for plants that are homozygous for the resistance alleles. These clones will have a higher resistance level and a better combining ability to produce resistant hybrids.
- *Accumulation of various resistance genes and other genes of interest.* Various resistance genes could be accumulated using MAS by crossing clones for which different QTL of resistance have been identified. It is also possible to use MAS to break linkage between favourable and unfavourable alleles located in the same chromosome region.
- *Early selection for resistance and other traits.* Increased selection efficiency in pre-breeding, at the nursery stage, would be possible by applying MAS on a limited number of resistance QTL (the stronger QTL, QTL for resistance to several *Phytophthora* species...) and to have available more plants to apply selection for other traits of interest in the field.
- *Combined use of marker information and phenotypic selection to constitute a selection index.* Information on a larger number of QTL could be combined with phenotypic selection related to resistance traits (e.g. intrinsic resistance revealed by leaf tests) or other traits of interest to constitute a selection index.
- *Application of MAS at other sites than those where QTL have been identified.* It is possible to accumulate QTL identified at different sites for resistance to diseases not present in the country (examples: screening in Montpellier for resistance to *P. palmivora*, *P. megakarya*, *P. capsici* or possible selection of field resistance to *P. megakarya* on the basis of QTL identified in Cameroon).

The first results obtained in the CAOBISCO project allow to put in place several experiments to test different MAS strategies (selfing clones to fix resistance genes in homozygous condition, accumulating various resistance genes). However the identification of QTL in important other resistant clones has to be continued to identify all major sources of resistance to *Phytophthora* in cocoa.

\* This is the summary of the paper presented by Claire Lanaud at the INGENIC Workshop. For the full paper of Claire Lanaud *et al.* on QTL detection for resistance to *Phytophthora*, please consult the Proceedings of the 13<sup>th</sup> International Cocoa Research Conference.